CLAIMS

What is claimed is:

1. A rapid white balance method for processing a color digital image applied to an RGB color space of the image, the method comprising the steps of:

dividing the image into a plurality of blocks to obtain a reference G parameter, G_{ref};

obtaining an averaged R value, R_{savg}, and an averaged B value, B_{savg}, of each of the blocks according to the division;

computing a reference R parameter, R_{ref}, and a reference B parameter, B_{ref}, according to the averaged R value and the averaged B value of each block;

computing a R gain, R_{gain}, and a B gain, B_{gain}, from the reference R parameter and the reference B parameter; and

adjusting the image according to the R gain and the B gain.

2. The method of claim 1 further comprising the step of:

computing an adjustment parameter from the R gain, Rg_{k-1} and the B gain, Bg_{k-1} before the adjustment and the R gain, Rg_k and the B gain, Bg_k after the adjustment; and

analyzing the adjustment parameter and redoing the image division step if the adjustment parameter is greater than a threshold.

3. The method of claim 1, wherein the image is divided into 40 columns and 30 rows of blocks of equal size.

4. The method of claim 1, wherein the step of dividing the image into a plurality of blocks to obtain a reference G parameter dynamically divides the image into a plurality of blocks following the steps of:

setting initial numbers of rows and columns;

dividing the image into a plurality of block according to the initial numbers of rows and columns;

obtaining the G values of all pixels in each block and computing an averaged G value, G_{savg}, for each block from the G values of the pixels;

selecting a plurality of characteristic blocks form all the blocks according to the averaged G values; and

computing the reference G parameter according to the averaged G value, G_{save} of each characteristic block.

5. The method of claim 4 further comprising the step of checking the reference G parameter; wherein if the reference G parameter is greater than a G parameter threshold then the numbers of rows and columns are reduced and the procedure starts all over from dividing the image into blocks.

6. The method of claim 4, wherein the step of selecting a plurality of characteristic blocks according to the averaged G value of each block is done by selecting those with top 10% averaged G values.

7. The method of claim 4, wherein the step of computing the reference G parameter according to the averaged G value of each characteristic block comprises the steps of:

computing the averaged G value of all characteristic blocks according to the averaged G value of each characteristic block;

computing the mean square difference , σ_{ave}^{2} of the averaged G value , G_{tave} of the characteristic blocks and the averaged G value , G_{save} of each of the characteristic blocks; and

determining the reference G parameter according to the mean square difference and the averaged G value of the characteristic blocks.

8. The method of claim 7, wherein the mean square difference is computed according to the formula $\sigma_{ave}^{2} = \sum_{i=1}^{K} (G_{save,i} - G_{tave})^{2} / K$

9. The method of claim 7, wherein the step of determining the reference G parameter according to the mean square difference and the averaged G value of the characteristic blocks uses the following algorithm: if G_{tave} >=170 and σ_{ave}^{2} <=170, then the reference G parameter is equal to the averaged G value, G_{tave} of the characteristic blocks.

10. The method of claim 7, wherein the step of determining the reference G parameter according to the mean square difference and the averaged G value of the characteristic blocks uses the following algorithm: if G_{tave} <170, then the reference G parameter is the maximum averaged G value, G_{save}.

11. The method of claim 7, wherein the step of determining the reference G parameter according to the mean square difference and the averaged G value of the characteristic

blocks uses the following algorithm: if G_{tave}>170 and σ_{ave}^{2}>170, then the reference G parameter is the averaged value of the top 5% G_{save}.

12. The method of claim 5, wherein the reference G parameter threshold is between 232 and 252.

13. The method of claim 1, wherein the step of obtaining the averaged R value and the averaged B value of each block according to the division further comprises the steps of:

obtaining the R value and the B value of each pixel using a sensor; and

using the R value and the B value of each pixel to compute an averaged R value, R_{savg}, and an averaged B value, B_{savg}, for each block.

14. The method of claim 1, wherein for the step of using the averaged R value and the averaged B value of each block to compute the reference R parameter and the reference B parameter of the image,

the reference R parameter in is computed using the formula $R_{ref} = (\sum_{i=1}^{K} W_{1i} * W_{2i} * R_{save}) / (\sum_{i=1}^{K} W_{1i} * W_{2i})$, where the weight $W_{1i} = \frac{1}{1 - \exp(-1)}\left(1 - \exp(-x_i^4)\right)$ with $x=\sqrt{R^2+B^2}$ and the weight $W_{2i} = 1 / \exp((x_i - 1)^2 / x_i)$ with $x=R/B$; and

the reference B parameter in the step is computed using the formula $B_{ref} = (\sum_{i=1}^{K} W_{1i} * W_{2i} * B_{save}) / (\sum_{i=1}^{K} W_{1i} * W_{2i})$, where the weight $W_{1i} = \frac{1}{1 - \exp(-1)}\left(1 - \exp(-x_i^4)\right)$ with $x=\sqrt{R^2+B^2}$ and the

weight $W_{2i} = 1 / \exp((x_i - 1)^2 / x_i)$ with x=R/B.

15. The method of claim 1, wherein

the R gain is computed according to the reference R parameter using the formula $R_{gain} = 1.2 + \gamma * (x - 1.2)$, where x= G_{ref} / B_{ref}; and

the B gain is computed according to the reference B parameter using the formula $B_{gain} = 1.2 + \gamma * (x - 1.2)$, where x= G_{ref} / R_{ref}.

16. The method of claim 15, wherein for the formula $1.2 + \gamma * (x - 1.2)$

if $x \leq 0.8$, then the gain is 0.8;

if $0.8 < x < 1.2$, then $\gamma = 1$ (i.e., the gain is equal to x);

if $1.8 > x \geq 1.2$, then $\gamma = 1 - e^{-(x-1.2)}$; and

if $x \geq 1.8$, then the gain is 1.8.

17. The method of claim 1, wherein the image adjustment is done by multiplying the R and B values of each pixel in the image by the R gain and the B gain.

18. The method of claim 2, wherein the adjustment parameter is computed using the formula $(Rg_k - Rg_{k-1})^2 + (Bg_k - Bg_{k-1})^2$.

19. The method of claim 2, wherein the adjustment threshold is between 0.0015 and 0.0025.